CLAIMS

We Claim:

1. A method for optimizing a multivariate representation of resources which are used in producing a set of products, the resources, products and their respective connectivities being represented in a product space plan, the method comprising:

converting an expected value function associated with the resources and products into a closed form expression;

transforming the product space plan into a working transformed space plan, wherein the products are transformed into working elements;

performing a loading step to form elemental blocks as a function of a single variable with elements being loaded with resources that gate production of the element;

performing a re-loading step to form elemental blocks as a function of a single variable with elements being reloaded with resources that gate production of the element;

solving for the maximum of each elemental block over each associated single variable; and

determining the optimum level of resources as a function of the solved for maximums.

2. The method of Claim 1, wherein the loading and re-loading steps result in an equilibrium configuration that provides the minimum amount of resources to produce any given amount of products across the whole plan.

3. The method of Claim 1, wherein the loading step further includes:

sequentially looking at each present working element;

determining if each associated resource gates production of the element,

if gating occurs, then unloading the resource from a prior element if so loaded, and

loading the resource onto the present element.

4. The method of Claim 3, wherein the reloading step further includes:

sequentially looking at each present working element;

reloading each unloaded resource back onto the element;

redetermining if the element is gated by each reloaded resource;

if the element is so gated, then merging the elements sharing each gating resource into a common elemental block which is a function of a single variable.

5. The method of Claim 3, wherein step of determining that gating occurs includes calculating a new maximum for the loaded element and determining if any remaining components further gate the maximum.

6. The method of Claim 4, wherein step of redetermining that gating occurs includes recalculating a new maximum for the reloaded element and determining if any remaining components further gate the maximum.

7. The method of Claim 4, wherein the step of merging the elements results in an elemental block that is a sub-plan of the overall plan, but which is a function of a single variable.

8. The method of Claim 7, wherein the merged elements intersect at a common resource in the transformed space.

9. The method of Claim 1, wherein the expected value function represents a statistical expectation of the value function at a given resource allocation and for a given demand distribution.

10. The method of Claim 1, wherein the transforming step involves taking a transformation of the product space to provide the working transformed space wherein the distribution induced on the resources is transformed into a distribution with zero mean and unit variance.

11. The method of Claim 10, wherein the transformation includes an inverse Cholesky transformation of the product space to provide the working transformed space.

12. A method for optimizing a multivariate expected value function which represents a statistical expectation of the value function at a given component allocation and for a given demand distribution, the method comprising:

forming a plan in the product space associated with the expected value function which represents the products, components, and connectivities therebetween;

transforming the product space plan to form a corresponding working space plan, with products corresponding to elements such that the distribution induced on the resources is transformed into a distribution with zero mean and unit variance;

converting the associated expected value function into a closed from expression;

performing a loading step which loads each element with components that gate the production of each element;

performing a reloading step which reloads components that were unloaded from an element in the loading step;

merging elements that are further gated by components that were unloaded, with the loading, reloading, and merging steps resulting in an equilibrium configuration; and

solving the equilibrium configuration to determine the optimization of the expected value function.

13. The method of Claim 12, wherein the demand distribution includes any multivariate demand distribution that is a member of the elliptical family of distributions.

14. The method of Claim 13, wherein the multivariate demand distribution includes a multivariate normal distribution.

15. The method of Claim 12, wherein the transforming step includes using an inverse Cholesky transform.

16. The method of Claim 12, wherein the loading step includes:

sequentially analyzing each element in the plan;

determining if each associated component gates production of the element,

if gating occurs, then unloading the component from a prior element if so loaded, and

loading the component onto the present element.

17. The method of Claim 16, wherein the reloading step further includes:

sequentially analyzing each element in the plan;

reloading each unloaded component back onto the element;

redetermining if the element is gated by each reloaded component.

18. The method of Claim 12, wherein the equilibrium configuration includes configuring of the plan into elemental blocks which are a function of a single variable.

19. The method of Claim 18, wherein each elemental block is maximized over this single variable.

20. The method of Claim 19, wherein the optimum level of components to support the maximizations are derived from the maximized elemental values.

21. A method for optimizing the multivariate amount of refinements produced from a level of resources, the method comprising:

configuring the refinements and resources in a representative refinement space plan that accounts for connectivities therebetween;

deriving an expected value function for the refinement space plan;

converting the expected value function to a closed form expression;

transforming the refinement space plan into a working space plan, with the refinements represented by transformed elements;

sequentially loading each element with resources that gate the production of each element;

sequentially reloading components that were unloaded from elements in the loading step;

merging elements that are further gated by components that were unloaded, with the loading, reloading, and merging steps resulting in an equilibrium configuration; and

solving the equilibrium configuration to determine the optimization of the expected value function.